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ABSTRACT

The budget decision making process at Stanford University, California, from 1970 through 1979 was evaluated in relation to the allocation of general funds to 38 academic departments. Using Simon's theory of bounded rationality and an organizational level of analysis, the Stanford decision process was tested for its rationality through triangulation, mixing qualitative and quantitative methods. The elements that must be present for rational decision making required that the provost who directed Stanford's budget process must have had a consistent set of budget allocation priorities throughout the decade; that he considered a wide range of expenditure alternatives simultaneously rather than sequentially; that he made budget decisions himself, with information about the likely effects and costs of each request; and that his choices were consistent with his prior goals. It is suggested that the provost considered the following four priorities to guide his decisions about allocating general funds in the operating budgets: academic importance, student interest, possibility for excellence in the program, and funding potential. The number of alternative expenditure requests considered by the provost is documented, and the evidence indicates that he made simultaneous decisions. Content analysis of the rationales for expenditure requests is evaluated along with a regression equation to determine whether the provosts made choices consistent with prior goals. Although the results suggest that the process was rational, the decision processes probably conform to more than one theoretical model. In addition, the decision process and decision outcome may be independent, so that one cannot be predicted from the other. A bibliography is appended. (SW)

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Rational Budgeting? The Stanford Case

Abstract

The budget decisionmaking process at Stanford University during the 1970s was said to be rational, although both theory and other empirical studies suggested it was more likely political or bureaucratic. Using Simon's theory of bounded rationality and an organizational level of analysis, the Stanford decision process was tested for its rationality through triangulation, mixing qualitative and quantitative methods. Although the results suggest that the process was rational, when taken in the context of other university budget studies alternative conclusions appear more supportable. First, decision processes probably conform to more than one theoretical model. Second, decision process and decision outcome may be independent, so that one cannot be predicted from the other.

Rational decisionmaking is generally conceded to be a normative ideal, but not susceptible to practice. It is thought to be unrealistic because rational theory prescribes an ordered sequence of events that cannot be followed in real decisions, and because it requires powers of search and comprehension that human beings do not have for most decision problems of typical complexity (Cyert and March 1963; Cyert, Simon, and Trow 1956; George 1975; Nutt 1976; and Simon 1955 and 1976).

Because of such implementation problems, actual decision processes are rarely described as rational. However, in at least one case, participants in and observers of an annual decision process that reoccurred for almost ten years believed that it was rational (George 1980, Poulton 1979). The process was allocation of general funds to academic departments at Stanford University during the 1970s. The belief that it was rational is difficult to accept for three reasons, one of which is the implementation problems described above. Second, Stanford's resources were scarce during the 1970s, with a $16 million budget reduction campaign in progress, and scarcity is thought to induce political behavior rather than rationality (Hills and Mahoney 1978, Rubin 1977). Third, university budgeting on other campuses has been shown to be political and bureaucratic (Pfeffer and Salancik 1974, Hills and Mahoney 1978, and Pfeffer and Moore 1980). The purpose of this study is to test whether Stanford's budget decision process in the 1970s was rational.

In order to place the study in its appropriate intellectual context and to plan a viable research design, several decisions were in order that might have been self-evident in a less confused and multi-faceted domain. The

literature on decisionmaking is vast, having sizable components within such varied disciplines as economics, operations research, political science, psychology, social psychology, sociology, business policy, and organizational behavior. Therefore, the term "rational decisionmaking" might properly evoke images of diverse levels of analysis (individual, collective, group, and organization), several categories of operational variables (such as decision rules, organizational structure, longitudinal processes, or cognitive functions), and a host of definitions of rationality, ranging from the formal, precise, technical version of the economist to the vague connotations of sensibility and reasonableness of the layperson (see, for example, Diesing 1962 and Garfinkel 1960).

Mapping the terrain of rational decisionmaking is beyond the scope of this paper, and it has not been done elsewhere. The scope and ambiguity of that terrain require that researchers define precisely what they purport to undertake, and that their work be evaluated for what it is, and the appropriateness of that, rather than for what it is not.

Specifically, this is a study of the decision process used by an organization. The purpose is to determine the extent to which that process conformed to a selected theory of rational choice. Because it is a study of decision process, several steps in decisionmaking and patterns of interaction among participants over time will be examined. The phenomenon is dynamic, not static. Because it is a study of organizational decisionmaking, the cognitive processes of a single individual are not the focus; rather, we will examine the nature of the interactions among several individuals. Because it is a study of rational choice, it is rational theory that directs the identification of the stages and interaction patterns in the organization. The theory

selected is a behavioral model, called bounded rationality, proposed by Simon (1955, 1976, 1979). Simon developed bounded rationality as a realistic alternative to economic rationality.

These research decisions suggest that the proper theoretical frame of reference is Simon's bounded rationality in the context of organizational decisionmaking. The empirical context is other studies of rational decisionmaking at the organizational level of analysis, and the methodological background is processual.

Literature Review

Many organization-level theories of decisionmaking have been proposed. Political science provides models of partisan mutual adjustment (Lindblom 1959), multiple adovcacy (George 1975), and governmental politics (Allison 1971), among others. Collegiality is widely known, its parameters for higher education described by Millett (1962). The bureaucratic model was presented first by Weber (1947), with subsequent variations such as Allison's organizational process model (1971). One of the newer models is organized anarchy (Cohen and March 1974).

These models can be clustered by type, with headings such as rational, political, bureaucratic, consensual, or loosely coupled systems. It is the class of rational models that is of interest here.

Rational decisionmaking. Classic economic rationality underlies the theory of the firm, asserting two basic assumptions: that firms have a specific goal (profit maximization) and that firms operate with perfect knowledge of alternatives and consequences (Cyert and March 1963, 8). Nutt (1976) calls the economic model "normative decision theory," listing these as its

key assumptions: goals are known, needed information is obtainable, adequate resources are available, prediction is feasible, effects are judged according to criteria, and cause-effect relations are known (p. 86). This version of rationality is criticized for two major problems: the motivational and cognitive assumptions of the theory are unrealistic, and the firm in theory is much less complex than the firm in practice (Cyert and March 1963, 8).

Simon relaxed some of these assumptions in creating bounded rationality, primarily by allowing the choosing organism to select a satisfactory alternative rather than the single best alternative. Nutt's version of Simon's theory is called behavioral decision theory, with these assumptions: goals are inferrable through domain decisions, alternatives cannot be completely known, some predictions can be made but not all of them, and resources interact with decision processes (1976, 86). This model describes what "skillful decisionmakers often try to do when grappling with complex decisions" (Nutt 1976, 89). March comments that bounded rationality has come to be widely recognized "both as an accurate portrayal of much choice behavior and as a normatively sensible adjustment to the costs and character of information gathering and processing by human beings" (1978, 589). The references that support March's statement, however, are not studies of organizational decision processes--they are studies from mathematics and operations research.

Empirical studies. The rational actor model proposed by Allison (1971) is based on Simon's bounded rationality. Allison defined rational decision-making to consist of four elements: goals, alternatives, consequences, and selection of those alternatives whose consequences rank highest among the decisionmaker's values. Allison used these elements to examine rationality through a qualitative, historical analysis of the Cuban missile crisis

decisions, and Weil (1977) used Allison's model for a study of North Vietnamese foreign policy, combining quantitative and qualitative analyses.

Other studies of rational decisionmaking at the organizational level of analysis have used other models of rationality. Cyert, Simon, and Trow (1956) used a case analysis of the decision to buy electronic data processing hardware to illustrate (a) the inadequacies of the classic rational decision model and (b) that an unstructured decision process could be programmed. Carter (1971) used the behavioral theory of the firm that was proposed by Cyert and March (1963) to study six top-level corporate planning decisions. The Cyert and March model was combined with Cohen and March's organized anarchy (1974) in a study of university budget decisionmaking under stress (Rubin 1977). Personnel decisionmaking in public agencies was studied quantitatively on the basis of participant survey data by Nalbandian and Klingner (1980). These authors equated rationality with computational strategy, which is expected when participants agree on organizational goals and on the means to achieve them (Thompson 1967). Finally, Skok (1980) produced a study of state budget decisionmaking that compared incrementalism with rational-comprehensive budgeting, defining the latter as zero-based, data-influenced choice.

The only common element in these studies is that they dealt with what each called rational decisionmaking at the organizational level of analysis. They differ substantially in the kinds of decisions they examined, the kinds of organizational settings they used, the ways they defined rationality, and their empirical methods. Only two (Allison 1971 and Weil 1977) explicitly tested for the extent to which a rational decision model generally characterized the behavior of actors in an organization with respect to a specific decision. The others examined the extent to which selected rational behaviors

(search for information, computation, criteria for evaluating options) were used. The two studies that are most similar to this one shared a single major finding: decisions do not correspond neatly to a single decision model--they vary both within and across levels of analysis.

Research Method

The two major methodological problems in studying organizational decision processes are (1) participants are not a good source of data and (2) the target is a moving one--a process that unfolds over time and is composed of diverse elements.

With regard to the first problem, Nisbet and Wilson (1977) reviewed a large number of studies, concluding that individuals have little or no ability to report their cognitive preferences accurately. What is reported is usually based on some implicit theory or past behavior, not on true preferences. Since the study of rational decisionmaking depends in part upon matching choice behavior with prior preferences, the fact that there is a weak correlation between reported self-insight and objective choices (Slovic and Lichtenstein 1971), and that the theories in people's heads frequently do not match the theories they act upon (Argyris and Schon 1978, Van Maanen 1979) is a problem--how does one identify true prior preferences, rather than post-hoc justifications? The problem is confounded by the normative value of rational decisionmaking--when asked, people are likely to bias their responses toward the appearance of rationality because it is widely preferred.

A research method that is variously called policy capturing (Slovic and Lichtenstein 1971), judgment analysis (Rohrbaugh 1978), or multi-attribute theory (Huber 1974) helps solve this problem. Respondents are presented with

hypothetical choices. The choices are set up so that analyzing the responses allows one to see the tradeoffs made and thereby establish the preference function of the respondent. In the case of budget research, where real decisions have measurable outcomes, hypothetical problems are not required. If the implicit tradeoff characteristics of the alternatives can also be measured, policy-capturing research can use actual field data.

This was the approach used in three previous university budget studies (Pfeffer and Salancik 1974, Hills and Mahoney 1978, Pfeffer and Moore 1980). The authors regressed each department's share of the annual operating budget on each department's score for a quantitative variable that represented a decision model. In one case, for example, the authors used student credit hours as a measure of the bureaucratic model and faculty representation on university policy committees as a measure of the political model. This approach is based on the fact that each decision model has a rule by which one alternative is chosen rather than another. In the bureaucratic model, the rule is automatic fair-share allocation based on workload; in the political model, the rule is allocating more resources to more powerful parties. Viewing the organization anthropomorphically, the method of previous budget studies tested the organization's value structure by policy capturing, asking the question, "Did the organization allocate resources by a bureaucratic decision rule, or by a political decision rule?"

Policy capturing will be used here, but one additional feature is required in order to test for rationality. In the rational model, unlike the bureaucratic and political models, the decision rule is to maximize a situation-specific set of values. Therefore, before policy capturing can be used here, a specific set of budget-related values held at Stanford during the

1970s will have to be identified.

Policy capturing does not solve the second problem--how to analyze the stages and events of the dynamic decision process. First, the stages as they are prescribed by theory must be identified; then a method or methods must be devised for determining whether Stanford exhibited those behaviors. As previously stated, we will use the stages of bounded rationality from Simon (1955), but as operationalized by Allison--who notes that his model is more stringent, closer to economic rationality, than is Simon's (1971, 288). The Allison model is, in fact, similar to a description of economic rationality in Cyert, Simon, and Trow (1956).

The stages are outlined in table 1. The elements that must be present for rational decisionmaking are goals that are known before the decision is made, an extensive set of alternatives from which to choose, consequences that are reasonably well-understood, and a choice that satisfies the preferences. Implicit in this list is a chronological order, requiring primarily that goals be available early and that deliberation on alternatives and consequences precede choice.

Next, the research method required observable criteria for these stages, which are also presented in table 1. If these criteria are satisfied by various kinds of evidence, to be discussed below, then the Stanford budget process is inferred to exhibit the corresponding elements of the rational model. The study required that the provost, who directed Stanford's budget process, show evidence of a consistent set of budget allocation priorities throughout the decade of the study (prior goals); that he show evidence of considering a wide range of expenditure alternatives simultaneously rather than sequentially (extensive alternatives with opportunity for tradeoff

analysis); that he make budget decisions himself, with information for each request about its likely effects and costs (understood consequences); and that his choices be consistent with his prior goals (satisficing choice).

An eclectic research method is required to handle the diversity in these criteria. The approach amounts to triangulation (Webb et al. 1966, Denzin 1978, Campbell and Fiske 1959) in which the convergence of two methods ". . . enhances our belief that the results are valid and not a methodological artifact" (Bouchard 1976, 268). Wherever possible, the strategy was to use multiple methods for analyzing these multiple traits of the rational model. In addition, simply having divided the rational model into four separately tested elements ensures four tests for the model.

There are two major concerns in triangulation. One is how to recognize when evidence has converged, given the likelihood that evidence will be ambiguous or necessarily incomplete. The other is assigning relative weights or values to pieces of evidence (Jick 1979). Is one document more convincing than another because of its source? Is content analysis more persuasive than survey results? Both of these concerns must be dealt with as a matter of judgment.

One goal of triangulation is to balance quantitative and qualitative data. In so doing, one has the advantage of numerical results, which can be subjected to standard procedural safeguards and thereby achieve replicable and relatively objective results, and one also has the advantage of substantial first-hand knowledge of how the process works, with which richer interpretations of both kinds of data can be developed than is feasible with quantitative data alone. Table 2 shows the methods of testing each of the four criteria. Qualitative analysis for the first two criteria includes simple assessments

of written documents (looking, for example, for the answer to the question, "Did the provost state his goals early in the 1970s, and was he consistent in reiterating those goals?") and participant observation during the last two years of the decade primarily to verify that the sequence of events was as represented in written documentation. Quantitative analyses included simply counting expenditure requests, content analysis, and a complex policy-capturing regression analysis.

The study focused on allocations of general funds in the operating budget to thirty-eight academic departments at Stanford during 1970 through 1979. The provost and primary decisionmaker was William F. Miller. The departments were members of the Schools of Humanities and Sciences, Engineering, and Earth Sciences, excluding only the departments in those schools that did not exist for the entire ten-year period. Four other schools at Stanford were excluded because none of the four was subdivided into academic departments and two of the four received funds in a special budget process that was unlike the one under study.

Results

Criterion 1: Goals. The first criterion required that the provost have a consistent set of priorities regarding what he was interested in funding from the operating budget, and that he express it early in his term and consistently throughout the 1970s. In a 1972 report, Miller listed these "principal elements that enter a decision about the future of a program:"

1. academic importance,
2. student interest,
3. possibility for excellence in the program, and
4. funding potential (1972b, 3).

These items are reiterated as four necessary conditions of a program in the draft of a document on the budget process prepared by Miller's vice provost (Bacchetti, 26 July 1972). In a 1975 letter, Miller identified them as the four criteria he had often expressed for establishment of a program (6 January 1975). Miller used two of the four in both internal and public justifications for eliminating the department of architecture (3 June 1975, 20 July 1975). Later, he called the four items fundamental criteria for judging academic programs (1978). Miller explicitly applied the four criteria to his annual budget decisions both in the "Operating Budget Guidelines" (1975) and in a later interview (25 July 1980). Although there is some indication that Miller intended to use two of the four criteria--academic importance and funding potential--less for budget decisions and more for decisions about starting or terminating a program (1978, 1980), he generally seems to have intended these four criteria to guide his decisions about allocating general funds in the operating budgets. This frequent and consistent reiteration appears to satisfy the first criterion for the rational model.

Criterion 2: Alternatives. Second, in a rational process the provost would simultaneously consider a wide array of spending alternatives every year. The key terms to be tested are "simultaneously" and "wide array." The test is simplified by the fact that the chronology of budgeting events each year remained essentially the same throughout Miller's term of office.

In a memo to the president, Miller stated his intention to "form a protocol here that will require the studies within each of the Schools of enrollment, retirement, etc." (5 October 1971). A memo to Miller from Vice Provost Bacchetti (29 February 1972) outlines a chronology of events for operating budget decisions. This same chronology is reiterated in the

1973 and 1974 protocol letters from Miller to the deans (4 October 1973, 21 October 1974) and in every edition of the annual booklet called "Operating Budget Guidelines" published from 1973 through 1980. The annual sequence of events was remarkably stable throughout the decade; the question is, did it allow for simultaneous consideration of a wide array of alternatives?

Each of these chronologies shows an eighteen-month sequence of events. Within that sequence is a four-month "protocol process." Each year the provost wrote to the deans describing apparent constraints on the budget and posing detailed questions about the school's plans. He then met with them individually to discuss their wishes and his convictions, and each dean wrote a budget letter detailing his requests. The vice provost then prepared a detailed list of all such requests for the provost's consideration. This list and the documentation provided by the deans gave the provost the opportunity to consider alternative expenditures simultaneously. Furthermore, there is evidence that the provost rejected attempts to circumvent the process by bringing requests forward for a decision at some other time when tradeoff values could not have been considered (Miller 23 November 1971 and 13 October 1972).

Whether the provost had a wide range of alternatives to consider is a matter of judgment. Each dean probably screened out many requests from departments so that the provost never saw them. However, the provost certainly had many alternatives. In the seven years for which complete sets of dean's budget letters could be found, 284 requests for funds were made on behalf of the thirty-eight departments in the study. Averaging 40.6 requests per year, the provost had just over one request per department per year with a mean of $9255 per request. These figures assume some proportion when viewed

in terms of the rate at which they were funded. Documentation of the provost's decisions was available for the last four years of the study. During that time, the provost had 156 requests. He authorized general funds in 97 (62%) of the cases, but full funding for only 36 requests (23%). The provost therefore had four times as many alternatives as he thought merited full funding, and 1.6 times as many as he thought merited any general funds.

The evidence for simultaneous decisions is unequivocal. The evidence for quantity of alternatives shows that he had many more than he could or would fund, but this is not a criterion that allows for unequivocal assessment.

Criterion 3: Consequences. The third criterion deals with the quality of information available to the provost: Was it sufficient to allow him to relate requests to his preferences through some understanding of costs and effects?

Miller was quite clear in his expectation that deans' budget letters would provide him with objective information. "In all the reviews . . . reliance will be placed heavily upon systematic evidence and carefully considered judgments . . . . Unsupported views and anecdotal evidence of value will be of little assistance . . . ." (21 October 1974). In 1978, Miller asked for "supporting argument and where relevant and available, documentation" for each budget request in the deans' letters (15 October 1978). These letters were not Miller's only source of information, however: "Though we have both been working on the 1975-6 budget since at least last May, the transmittal of the accompanying protocol begins the more formal and focused budget process" (Miller 21 October 1974). Still, the deans' budget letters ought to summarize the information for each request, if the deans responded to the provost's charge. Therefore, it is to these letters that we turn for evidence about

the provost's cause-effect information.

When requests affecting multiple departments are consolidated, the deans wrote 165 rationales for expenditure requests in the last seven years of the period. Content analysis was applied to each rationale, using a six-item dichotomous-choice questionnaire. Scoring involved answering yes (1) or no (0) as to whether the dean's rationale:

1. included explicit reference to meeting some goal or objective,
2. documented the need to solve the problem or meet the goal,
3. referred to alternative means of meeting the need, other than the means proposed,
4. defined results expected if the request is funded,
5. showed that the recommended solution has the most favorable cost-benefit ratio, and
6. explicitly identified the value(s) that would be expressed by funding the request.

The consistent theme of relating causes with desirable effects, which is central to the rational model, is readily apparent in these items. Summing the number of "yes" answers yielded a score between zero and six for each request rationale. The scores of four raters yielded an average Pearson product-moment correlation of .34--low in absolute value, but significant at $p < .02$. The scores of the rater with the highest inter-rater correlations were used for the following analysis.

The mean score for the 165 requests in this analysis was 3.15, with a mode of 4.0. Most scores (69%) were either three or four, out of a total of six possible points. According to these results, the deans gave the provost some or most, but not all, of the information he needed when they wrote their

budget letters.

While the evidence is not strong, it is impressive when viewed in context. The writing styles of deans are idiosyncratic, as are their reasoning styles. There is considerable evidence in the letters that deans and provost communicated both orally and in writing about these requests in forums other than those evaluated in this analysis. That these deans' rationales for expenditure requests provide as much information as they do suggests that the provost is in a good position to choose rationally among them--especially when dealing with the satisficing decision rule of behavioral rationality rather than the optimizing rule of economic rationality.

Criterion 4: Choice. With reasonable confirmation of the first three criteria, the analysis proceeded to a policy-capturing regression for the fourth: whether the provost's choices were consistent with his goals. A regression equation of the form

$$\text{Decision result} = \text{preference}_1 + \text{preference}_2 + \ldots + \text{preference}_n$$

was needed. The left side of the equation, decision result, is the allocated general funds for the operating budget of each academic department for each of ten years. That is the outcome of the budget decision process. Specifically, the endogenous variable is each department's proportional share of general funds each year. Expressing the budget as a proportion nets out the effects of inflation and across-the-board adjustments (Pfeffer and Moore 1980). The budget share variable will change from one year to the next only if a decision is made that some departments will receive relatively more or less than others receive.

As preference variables, the provost's list included academic importance, student interest, potential for excellence, and funding potential. The

regression equation requires a measure for each. Neither academic importance nor funding potential proved susceptible to measurement, however. The former is not explicated fully enough in Miller's writings to allow for a sufficiently concrete definition and the latter, Miller acknowledges, is difficult to extricate from a ring of circular reasoning (1978). Omitting these two variables does not bias a policy-capturing regression, however, when the rational model is not the economic version in which a full set of ordered preferences is expected. If Miller chose according to any one or more of these four goals, he satisfied the behavioral model of rationality. Therefore the regression equation will be estimated using measures of two of his goals.

The measure for student interest is students' registration for courses in the department. A strict test of the contribution of this goal is achieved by defining the measure as changes in the number of instructional units taught by the department (lagged one year to allow those changes to be known to the decisionmakers). The correlation between instructional units and budget shares before Miller took office was already high, $r = .77$, so defining the variable as changes in instructional units tests the provost's decisions without allowing him the benefit of historical correlation. For each of the ten years in the study, student interest is defined as the number of student instructional units taught in the year when the budget was decided, minus the number taught in the previous year.

This measure was not expressed as a proportion for two reasons. First, total Stanford enrollment was nearly constant throughout the decade, so departmental changes were not confounded by generalized growth, analogous to fiscal inflation or across-the-board changes. Furthermore, the most defensible assumption about the cost per student across departments was

that those costs were equal. The alternative assumptions were that costs per student at the margin varied by discipline or by department size. Although cogent arguments can be made for either alternative, no agreed-upon algorithms exist for treating departments differently on these bases. In some departments, the two effects may cancel each other out. For present purposes, an equal cost per student assumption was sufficiently precise.

The provost's priority on excellence cannot be measured as directly, but a reasonable approximation can be developed by considering it from the provost's point of view. One element is likely to be the national rank of a department as seen by its peers. Since the faculty at Stanford are aware of their department's rank (Washburn 1980), national rank may implicitly enter the provost's assessment, too. This variable alone is not sufficient to measure excellence, however, for three major reasons: (1) All Stanford departments for which the two most prominent surveys calculate ranks are in the top twenty. There is not a great deal of variance among Stanford departments on this measure. (2) The ratings are made by people outside Stanford; as an insider, the provost has considerably more information available to him. (3) Due to the infrequency of reputational surveys, rank is a constant that does not capture any subtle dynamics over the ten years of the study.

Washburn (1980), in a study of faculty from fifteen of the departments in the present study, found that service on university committees was the most frequent response when faculty were asked, "What accomplishments bring a local reputation for excellence to a department?" In addition, two of the top three responses to that question and another about what most affects administrators' judgments of department strength had to do with research: popular discoveries, important research, external research funding, and amount of research done.

Given the difficulty of measuring the importance of research, the research emphasis in these responses can only be captured quantitatively by measuring the funding for research.

Three elements that are likely to contribute to the provost's assessment of excellence have been identified: national rank, committee representation, and research funding. While it is true that these elements might represent an entirely different concept on another campus (a point to which we shall return), the Washburn study of Stanford faculty supports them as components of perceived excellence on that campus.

National rank data were collected from ratings published in Roose and Andersen (1969) and Ladd and Lipset (1977), with only minor discrepancies between the two surveys in their placement of Stanford departments. Committee representation was each department's proportional share of members on eleven major university-wide policy committees. Unlike rank, which was constant over time, committee representation and research funds varied each year. Research funds were each department's proportional share of total grants and contracts received by all thirty-eight departments that year. However, the number of departments for the remainder of the analysis reduces to twenty-four, since fourteen were in disciplines for which no national ranks are calculated.

Combining these three measures through factor analysis accomplishes two purposes: it allows assessment of the extent to which the three items seem to be measuring a single underlying construct and, if factor analysis does yield only one factor, it creates a single variable for the regression equation where there had been three measures of a single provostial goal. Using one variable per concept conforms to standard regression practice.

The results of factor analysis are presented in table 3. The three

measures do yield a single factor in which each variable makes a nearly identical contribution to the concept and 41% of the total variance in the three variables is accounted for (Eigenvalue divided by number of variables). The results support the idea that these three variables are components of a single factor, here called reputation rather than excellence because we are dealing with perceived excellence. The factor scores are used in the following regression to represent the provost's priority on excellence.

In order to correct for serial correlation that is inherent in time series budget equations, the regression was estimated using generalized least squares (GLS) rather than ordinary least squares (OLS). GLS requires one additional variable in the regression equation, a lagged endogenous variable, budget share in the previous year. The results of the policy-capturing regression were:

$$\text{Budget share}_t = .001 + .93\ \text{budget share}_{t-1} + .008\ \text{change in instructional units} + .12E\text{-}6\ \text{reputation factor}$$

$$R^2 = .9517$$

Additional technical data is provided in table 4. In summary, the regression equation shows that all three variables make significant contributions to explaining the variance in departmental budget shares, and that the two variables representing the provost's priorities add significantly to explained variance, beyond the contribution of incrementalism (budget share at t-1) alone.

The policy-capturing regression is clear in its support for the fourth criterion of the rational model. The provost did allocate general funds to these departments in ways that were consistent with his goals.

Discussion

Given that triangulation typically involves inconsistent and incomplete evidence, the conclusion these results suggest is surprisingly clear: the Stanford budget process, at the level of final provostial decisions, was compatible with bounded rationality. But placing the analysis in the context of previous budget studies reveals a fatal flaw. As it happens, the provost's goals and the available means for operationalizing them make the Stanford policy-capturing equation nearly identical to the equations used to test for the rational and bureaucratic models in Pfeffer and Salancik 1974, Hills and Mahoney 1978, and Pfeffer and Moore 1980. Student credit hours were used in all three as measures of the bureaucratic model, and in various contexts both committee representation and research funding were used as measures of the political model. Furthermore, replicating each of these studies using Stanford data produces results that are nearly identical to those of the earlier studies (Chaffee 1981).

The differences between the earlier studies and the Stanford results reported here are these: (1) The other studies relied entirely on a policy-capturing regression to identify decision models--they did not examine the stages and interactions of participants. (2) The other studies used model-identified goals rather than participant-identified goals as the exogenous variables in the regression. (3) Using Stanford data, the multiple correlation coefficient for the equations that replicated the earlier studies was actually <u>smaller</u> than that for the incrementalism equation that used only budget share at t-1 as the exogenous variable. That is, incrementalism alone explained budget shares better than did the models from previous studies.

Despite these differences in comprehensiveness and explanatory power between the rational test and those of earlier studies, the similar results on the fourth model criterion cast significant doubt on the validity of the clear conclusion one might otherwise have drawn from these findings. Many interpretations are possible.

First, it could be that a policy-capturing regression that includes measures of two decision models and does not include consideration of other stages and interactions in those decision models is an inadequate test. The fact that Stanford performed so consistently on the rational model test, yet also replicated the earlier, apparently contradictory, results, could be taken to demonstrate that the earlier method does not provide valid results.

Alternatively, every campus may be different from any other, such that the selection of variables to represent models must be (a) tailored to the campus in question and (b) independently verified, as was done through the Washburn study at Stanford and through faculty surveys in two of the earlier budget studies. This possibility is intellectually unsatisfying, inasmuch as research customarily involves the search for regularities rather than the search for uniqueness, and it is methodologically burdensome.

Third, it may be rational, in the colloquial meaning of "reasonable," to be political and bureaucratic in allocating university resources. It is easy to imagine that any budget process will have elements of all three models. As long as there is incrementalism, bureaucracy will rule the budget base; furthermore, as long as certain measurable elements of workload are present, as is true with student credit hours, some component of fair-share allocation by changes in workload is likely. The base provides stability, the workload allocation provides equity--two qualities that fit well within the definition of reasonableness.

It is also reasonable that politics will enter into virtually any process that is not analytically deterministic--that is, any process involving judgment. The preferences of the judge become known to the contenders, who (a) have differing levels of preferred qualities at the beginning, (b) have differing levels of motivation to influence the judgment, (c) have differing capacities to develop the preferred qualities, and (d) have differing capacities to appear to have the preferred qualities. These differences combine to make politicking inevitable and to prevent the judge from obtaining full and unbiased information. Yet if some actors have more of what the judge wants, or are willing and able to work harder or change more to get it, there is a certain justice or reasonableness in their finding greater benefit than the rest.

Fourth, perhaps it is politic to be rational, especially in the context of a major research university. Most of the key actors at Stanford are scientists of various kinds, or they are engaged in other critical intellectual functions in which they value objectivity, demonstrable causal relationships, and other attributes of rationality. When coupled with the common normative bias for rational decisions in our Western culture, this kind of training and orientation of the participants is likely to foster behavior that appears rational. Rational behavior may not only be customary, it may be effective in getting what one wants, while exhortation, bargaining, and other typical tools of the political decision process would not be effective political tools in this setting.

Finally, it may be that when it comes to budgeting, any decision process will produce results that are indistinguishable from the results of any other process. With incrementalism accounting for 94% of the variance in budgets, there is virtually no latitude for outcome variation, nor is there much

substantive significance associated with such variation--symbolic perhaps, but not substantive. So the satisfaction or dissatisfaction of participants with the process may depend not on how much money they receive, but rather on whether they can appreciate the process that produced the decision. If they can believe in the validity of the criteria that produced that outcome, and in the process by which they are measured against those criteria, then they may be satisfied with the outcomes as well.

Conclusion

This study lends further confirmation to the findings of Allison (1971) and Weil (1977) regarding the difficulty of describing an organizational decision process in terms of a single theoretical model. Future studies along these lines would do well to focus on understanding how the models interact--by levels of analysis? by stages of the decision process?

More generally, the Stanford results suggest the need to make a fundamental distinction between the outcome of a decision process and the process itself. Perhaps outcomes are identical regardless of decision process. Or one can effect a rational process without disturbing the (political and bureaucratic) forces that create decision outcomes. Less cynically, the importance of establishing a satisfactory decision process may be quite independent of the need for a change in the decision outcomes. The normative flavor of rationality leads many to assume that a rational decision is a better decision, when in fact a rational decision may simply be the outcome of a more comfortable process.

Table 1

Criteria to Test for the Rational Model at Stanford

Rational Model Decision Element	Criterion
Goals known, a priori preference function	Stanford's provost had and expressed a consistent set of budget allocation priorities throughout the 1970s.
Alternatives search for means to desired ends	The provost considered a wide range of expenditure alternatives, making his selections simultaneously rather than sequentially.
Consequences likelihood of producing desired outcomes	The provost considered all the expenditure alternatives with information about their costs and benefits.
Choice select the maximizing alternative	The provost chose expenditure alternatives that enacted his set of budget allocation priorities.

Table 2

Tests for the Rational Model Criteria

Criterion	Quantitative Tests	Qualitative Tests
Goals		written documentation
Alternatives	number of requests	written documentation participant observation
Consequences	content analysis	
Choice	policy-capturing regression	

Table 3

Factor Analysis for Reputation

	Factor Loading	Est. Communality
Share of grants and contracts	.64924	.24395
Share of committee members	.63929	.23880
National rank*	-.63474	.23638

Eigenvalue: 1.2331

Pooled cross sections (24 departments, 10 years)
*National rank is inversely scored.

Table 4

Policy-Capturing Regression for Criterion Four

Regression equation

$$Budget_t = .001 + .93\ budget_{t-1} + .0008\ units\ change + .12E\text{-}6\ reputation$$

R^2 = .9517146

Variables

	Mean	Std. Dev.	Correlations $Budg_{t-1}$	Reput.	Units chg.
Budget share$_t$	.033	.015	.97	.62	-.03
Budget share$_{t-1}$	.033	.015		.61	-.06
Reputation	-.96E-7	.82			-.03
Units change	-37.89	1732.17			

Tests for significance of contribution to R^2 #

Unique contribution: Full model variables	Restricted model	Variable tested	R^2_{fm}	R^2_{rm}	F
budget share$_{t-1}$ reputation units change	budget share$_{t-1}$ units change	reputation	.951715	.94683	23.87*
budget share$_{t-1}$ reputation units change	budget share$_{t-1}$ reputation	units change	.951715	.94838	16.30*
Total contribution:					
budget share$_{t-1}$ reputation	budget share$_{t-1}$	reputation	.948379	.94368	21.57*
budget share$_{t-1}$ units change	budget share$_{t-1}$	units change	.946831	.94368	14.04*

*Significant at $p < .01$

#Since this study used data from a population, not a sample, significance tests that depend on the standard error of estimate are inappropriate. Since what we really want to know in this study is whether each variable contributes to explained variance above the explanation of incrementalism (budget at t-1) alone, "significance" of these variables is defined in terms of contribution to R^2. Both the unique and total contributions of each variable are significant.

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